SE1 What is Driving Displays?

Organizer: Jed Hurwitz, Gigle Semiconductor, Edinburgh, United Kingdom
Chair: Marshall Bell, National Semiconductor, Pheonix, AZ

The display business is a multi-billion dollar market, with a wide range of solutions and technologies from the low-power display on your cellphone to an HDTV home cinema the size of your living room to even a virtual display. There are many different core technologies used for the generation and modulation of light, with different merits and challenges. This session will introduce some of those technologies and more importantly for the ISSCC community the role of the associated microelectronics that is an integral part of those applications.

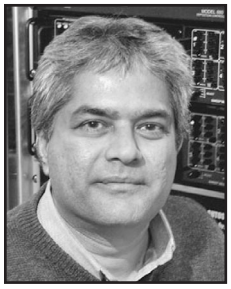
The speakers in this special education session come from various backgrounds and bring a collective experience of more than 50 years in the display industry. Dr Lee will talk about the driver IC technologies for TFT displays, Prof. Nathan will talk about flat panel active matrix Organic LED technology, Dr Jepsen will talk about Liquid Crystal on Silicon (LCOS) microdisplays for projection and Ian Underwood will introduce Polymer LED microdisplays for near-to-eye applications. This cross section of technologies, challenges and solutions should serve to introduce an attendee not just to the core display technology and the current State of the Art in the display arena, but it should hopefully stimulate new thoughts on the opportunities for silicon providers to serve this market.

Come and be illuminated!

Position Statements

TFT driver IC design: What are the Challenges?
Myunghee Lee, Samsung Electronics, Korea
Recently, the demand on the performance of TFT driver IC is ever increasing. Key requirements are smaller die size, higher number of channels/chip, lower power dissipation, higher resolution and better picture quality. These also apply to both large panel and mobile application. At the same time, new feature in Driver IC are needed to meet end-user's demand or new market. In order to meet these requirements, new system architecture and design approach are needed.

In this presentation, we are introducing two ICs: First driver IC is for mobile application which not only reflects some of those requirements but also provides new features such as integrated touch panel sensor and ALPS (ambient light processing system). Second driver IC is for large TFT panel based on WiseBusTM serial interface. This serial interface protocol is based a point-to-point and cascaded architecture, and current-mode link. This system significantly reduces the number of lines and necessary passive component count and offers better EMI.



AMOLED Displays and Driving Schemes

Arokia Nathan, University of Waterloo, Ontario, Canada

OLED displays have the potential to become the dominant display technology due to their numerous advantages over LCDs, such as superior picture quality, better contrast, faster on/off response, thinner profile, and higher power efficiency. For high resolution, active matrix OLED (AMOLED) addressing is critical, which uses a thin-film transistor (TFT) backplane to regulate the OLED current. The backplane can be made with amorphous silicon or polysilicon technology, all of which have significant drain-current degradation or mismatch problems, causing temporal or spatial variations in the OLED brightness. In addition, the efficiency of the OLED itself degrades over time due to organic material and contact issues, which makes AMOLED displays very susceptible to both TFT degradation/mismatch and OLED brightness degradation. Thus design of stable active matrix organic light emitting diode (AMOLED) displays comes with significant challenges that stem from the electrical property of the backplane materials, line parasitics in the matrix, and the opto-electronic property of the OLED. This presentation will review these design challenges along with possible on- and off-panel circuit solutions for long lifetime operation.

Analog Silicon For Digital Television and Other Oxymorons

Mary Lou Jepsen, Massachusetts Institute of Technology (MIT), Cambridge, Massachusetts

Silicon has hit the display, and in particular, the microdisplay. When silicon hits a new area significant disruption always occurs. Now, the revolution of integrated circuits marches right into the display. Once the display is inherently digital the distinctions fade between the display, the television, the games machine, the computer and the cell phone. Yet, the display must deliver information to the partially analog and subjective, biological endpoint of the human visual system, and often via (particular in the case of microdisplays) analog optical systems. To whit, immature manufacturing technologies and emergent nano-optics complicate things even further. Many of the problems and setbacks that the industry faced in the last decade have been solved, and microdisplay systems now account for the majority of big-screen television sales in the US. I will discuss how some of the biggest challenges have been faced, and what other opportunities the silicon enabled display creates.

CMOS Active Matrix Backplane Design for Microdisplays

Ian Underwood, Microemissive Displays, Edinburgh, UK

The direct coupling of electro-optical materials and devices onto the surface of a CMOS substrate has resulted in a class of electronic information displays known as microdisplays. These are capable of showing motion video and often use the functionality available in the CMOS to streamline or simplify other parts of the system. Microdisplays are viewed under high magnification in either a projection system or a virtual (near-eye) system; near eye systems include electronic viewfinders and wearable displays. This presentation will describe the constraints typical of a near-eye system and how they channel the design of liquid crystal and organic LED based microdisplays.